Deeper Research Directions

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Basic Design-Space Points for Rules

• FOL -- ISO Common Logic

• LP -- RuleML

• OWL + Horn -- SWRL

• Pick your favorite for your application!
  – But some are Webized better
More Research Challenges: Core

• Integrating rules with ontologies
  – Rules refer to ontologies (e.g., in RuleML)
  – Rules to specify ontologies (e.g., Description Logic Programs)
  – Rules to map between ontologies (e.g., ECOIN)
  – Combined rules + ontologies knowledge bases (e.g., RuleML + OWL)

• Describing business processes & web services via rules + ontologies
  – Rules query web services (e.g., in RuleML Situated feature)
  – Rules trigger actions that are web services (e.g., ditto)
  – Capture object-oriented process ontologies
    • Default inheritance via rules (e.g., Courteous Inheritance)
    • Wrapper/transform to legacy C++, Java, UML
    • Develop open source knowledge bases (e.g., MIT Open Process Handbook Initiative)
  – Event triggering of rules (e.g., capture ECA rules in RuleML)
  – Rules in process models, e.g., cf. OWL-S, PSL
More Research Challenges: Business Policies

• Apply advanced rule and ontology representation to business policies in compliance, trust, contracts, etc.
  – Application scenarios for compliance checking/support services intra- and inter-enterprise
  – Policy language & engines on top of rule language & engines
  – In/with existing/emerging standards: XBRL, XACML, P3P, ebXML, EDI, Legal XML, …
  – Strategy and roles in the market ecology: regulators, communal repositories, service providers, etc.
  – Embedding into the bigger pictures of financial services, e-commerce, semantic web services, business process automation
Some Interesting Directions for DAML Rules
(- but most of it beyond Program End)

• Preamble: ...

• These directions are for both RuleML and SWRL.

• CAUTION: Most of these directions have time horizon beyond the end of the DAML Program.
Some Interesting Directions for DAML Rules  
- some of it nearer term

• Alternative syntaxes
  – Presentation Syntax for human authoring
    • Draw upon ideas in Prolog, N3, HiLog/F-Logic, XQuery, RDF-Query
  – RDF syntax for RuleML

• Extend SWRL and RuleML towards FOL
  – Focus: define syntax
  – Coordinate with Simple Common Logic, DRS

• Application scenarios, use cases
  – E.g., Services SCAMP
  – E.g., ontology translation / data mappings
Some Interesting Directions for DAML Rules
- some of it nearer-term

• Inferencing techniques, with associated theory and complexity

• Translation mappings and techniques b/ rule systems
  – More rule systems/languages, esp. of types important commercially
  – ↔ Ontology systems too

• More implementation experience, generally
• Refine application ⇒ technical requirements/focus, generally
  – where’s the business/social value
Some Interesting Directions, cont. ’d

• Combine SWRL with Nonmon
  – A requirement from SWSI Rules
  – Negation-As-Failure, Priorities; Aggregations (require closing)
  – It’s already available in RuleML
• So one obvious approach is to translate SWRL to RuleML
  – … using DLP OWL2RuleML translator (e.g., SweetOnto)

• Extend SWRL to OWL-Full
  – How much immediate demand is there for this?
  – Can use HiLog techniques (e.g., in Flora-2)
Some Interesting Directions for DAML Rules

• More expressiveness in direction of existentials (head/outer).
  – E.g., simpler semantics/theory for anonymous existentials, bnodes, and their relationship to skolemization (cf. recent Yang & Kifer work)

• More about attached procedures cf. Situated LP and Jess/production rules, and some policy languages:
  – Dynamic sensing, e.g., query a web service
  – Actions/effectors with side effects
  – Develop use cases to start, e.g., in SCAMP

• Justifications, proofs, explanations – interchangeably
  – E.g., use and extend InferenceWeb

• Extension toward HiLog limited higher-order expressiveness (esp. LP)

• Extension toward Lloyd-Topor style syntactic sugar (esp. LP)

• Extension towards F-Logic extension, esp. in presentation syntax